SB761
U7R6
#88-3a

FOREST PEST MANAGEMENT

United States
Department of
Agriculture

Forest Service

Forest Pest Management
Denver, Colorado

BIOLOGICAL EVALUATION

R2-88-3a

Mountain Pine Beetle Mortality in Lodgepole Pine Casper and Muddy Mountain, Wyoming

1988

PREPARED BY:

CURTIS E. O'NEIL
Entomologist

APPROVED BY:

ROBERT AVERILL
Group Leader, Entomology

CHARLES W. FUDGE, Director
Timber, Forest Pest, and
Cooperative Forestry Management

Timber, Forest Pest, and
Cooperative Forestry Management
Rocky Mountain Region
USDA Forest Service
11177 W. 8th Avenue
Lakewood, Colorado 80225

LIBRARY COPY
ROCKY MTN. FOREST & RANGE
EXPERIMENT STATION

ABSTRACT

In 1987, the mountain pine beetle, (MPB) (Dendroctonus ponderosae Hopk.), infested 0.85 lodgepole pine (Pinus contorta Doug.) per acre on Casper Mountain, Wyoming. This is a 1 to 1 ratio between 1986-infested and 1987-infested trees. Landowners and cooperators are continuing salvage and preventive cutting to reduce the MPB impact and wildfire potential on Casper Mountain.

On Muddy Mountain 7.4 trees per acre were infested - a 18% decrease from the number infested in 1986. The heavy stocking and high incidence of pitchouts can indicate there is enough susceptible trees for the infestation to continue and the fire potential will remain high as long as the lodgepole pine stands are unmanaged.

INTRODUCTION

Casper and Muddy Mountains, Wyoming consist of extensive acres of even-aged, 80-90 year old, lodgepole pine in the upper elevations and uneven-aged ponderosa and limber pine on steep, lower elevation slopes. Even-aged stands of lodgepole pine have been created by fire. Based on stand age classes on Casper Mountain, two catastrophic fires occurred covering most of the mountain. The first fire occurred about 1810-1830 and the second about 1875-1895. More fires are likely to occur in the future on Casper and Muddy Mountains as MPB-caused mortality, combined with increases in mature timber, become more extensive.

Lessard (1982) determined that the lodgepole pine cover type was at moderate to high risk to MPB and the ponderosa pine cover type was at moderate risk. Low level MPB infestations were first detected in the area in 1979. Beetle populations had increased rapidly by 1981 (Lessard 1982). This population increase, combined with risk rating, indicated that up to 65% of the lodgepole pine could be killed by MPB within the next several years.

During the week of September 23, 1985, Pest Management Entomologists conducted a beetle brood survey on Casper/Muddy Mountains and found that the beetle population had collapsed during the winter of 1984-85. The large population decline subsequently resulted in a reduced number of infested trees by 0.21x and 0.55x trees per acre on Casper and Muddy Mountain, respectively. Cold temperatures during the winter of '84-'85 caused the beetle population to decline (Lessard, O'Neil, 1985), but had no bearing on reducing susceptibility of the tree stands to future MPB attacks. We expected losses to the beetle to increase within a few years as beetle populations recover. The purpose of this evaluation was to determine the trend of the infestation since the decline of the beetle population in 1985.

METHODS

Cruise lines, 1 chain wide, were run to tally each tree attacked by MPB within the past 2 years. The following information was gathered from each tally tree:

Diameter (dbh to 0.1 in.) of lodgepole, limber, and ponderosa pine by the following infestation classes:

a. 1987-infested
b. 1986-infested
c. 1985-infested
d. pitchouts

Strip attacks were included with infested trees but were distinguished on tally sheets so they could be analyzed separately. We calculated the ratio of new to old attacks by year to determine if tree mortality had increased, remained static, or decreased since 1985.

RESULTS

Muddy Mountain

Strip cruise data and MPB attack ratios indicate the MPB population is on a gradual decline. Tree attacks decreased by 18% from 1986 to 1987 from 9 trees/acre to about 7 trees/acre. From 1985 to 1986, a 13% decrease in attacks occurred. Sixty eight (68) percent of the tree mortality occurred in the 9 to 11 inch diameter range. See Data Summary, table 1.

Table 1. Summary of lodgepole pine attacked by MPB, Muddy Mountain, WY 1987

	1987	1986	1985	Pitchout
Infested/Acre	7.4	9.0	10.3	7.3
1/ Strip attack/Acre	0.74	3.9	0.60	N/A
Mean diameter	10.2	10.1	11.0	9.8

Attack Ratio	'87:'86	'86:'85
	0.82:1	0.87:1

1/ Strip attacks shown as portion of total infested per acre.

Casper Mountain

No significant changes in lodgepole pine mortality by MPB have occurred on Casper Mountain between 1986 and 1987. Tree per acre attacks are 0.82 for 1986 infested and 0.37 for 1987 infested - a 1 to 1 attack ratio. The 1 to 1 attack ratio indicates beetle-caused mortality is continuing at about the same rate annually. Beetle attacks occurred in the 8 to 16 in. (dbh) classes, with a uniform distribution of killed trees among the diameter classes. There was a significant number of unsuccessful beetle attacks (pitchouts) primarily in the areas where thinning has occurred. The following table (2) summarizes the strip cruise data on Casper Mountain.

Table 2 Summary of MPB attacked lodgepole pine, Casper Mountain, WY, 1987

	1987	1986	1985	Pitchouts
Infested/Acre	0.85	0.82	0.92	0.65
Mean diameter	11.4	12.7	12.0	12.8

Attack Ratio	1987:1986	1986:1985
	1:1	0.85:1

Cutting Units

There is a higher proportion (54%) of pitchouts in units where cutting has taken place. A total of 33.6 acres were surveyed on Casper, 6 acres of which were in cutting units; thus 53% of the pitchouts occurred in 18% of the total acreage surveyed. Pitchouts occurred mainly in the 9 to 14 inch diameter class trees.

Discussion

Casper and Muddy Mountain remain at moderate to high risk to MPB. Over the past 5-6 years, MPB caused-tree mortality, along with thinning on Casper, has changed the susceptibility of lodgepole pine from a high to more moderate risk category by reducing the proportion of larger diameter trees. In theory this implies a declining trend in MPB attacks and tree mortality over the next 10 years. The fact that on Casper Mountain more pitchouts and fewer recently infested trees occurred in cutting areas strongly indicate the cutting strategies, now in use, are working at reducing tree losses under beetle attack pressure and in addition, reducing the fuel load and potential catastrophic fires.

The cutting program on Casper Mountain is commendable and cooperators should continue with their aggressive forest management practices. It is recommended that silvicultural treatments be expanded to include Muddy Mountain.

The Biological Evaluations R2-82-1 and R2-85-9 both contain management alternatives, specifications and benefits of each alternative for Casper/Muddy Mountains. Each of the alternatives are valid to date - briefly the alternatives are:

1. Do nothing.
2. Clearcut or group selection and encourage natural regeneration.
3. Clearcut or group selection and plant.
4. Shelterwood cut and encourage natural regeneration.
5. Thinning from above.
6. Thinning small diameter stands ($\leq$7.0 in. d.b.h.)
7. Apply any combination of the above.

Appendices

A data summary of each survey cruise line on Casper and Muddy Mountain is provided in Tables A-1 through A-3. A map of the Casper/Muddy Mountain area is also provided (Figure 1).

Table A-1 Plot Summary of MPB infested trees
on Casper Mountain, Wyo., 1987

PLOT		GREEN INFESTED (1987)	ONE-YR. INFESTED (1986)	TWO-YR. INFESTED (1985)	PITCH OUTS
1	T/A	1.50	1.00	4.00	2.00
	x dbh	10.00	10.35	13.77	11.46
	s	3.03	1.74	2.60	1.70
2	T/A	1.50	1.00	0.38	0.50
	x dbh	11.18	10.95	10.50	10.45
	s	1.90	1.88	1.66	0.91
4	T/A	-	0.50	0.13	0.13
	x dbh	-	12.83	8.6	12.8
	s	-	3.28	0	0
5	T/A	1.25	-	-	-
	x dbh	12.00	-	-	-
	s	1.00	-	-	-
6	T/A	0.86	0.43	1.00	0.57
	x dbh	13.28	17.13	13.69	14.25
	s	2.05	4.45	2.00	0.53
7	T/A	-	2.00	-	0.67
	x dbh	-	12.50	-	16.60
	s	-	3.06	-	11.17
	MEAN T/A	0.85	0.82	0.92	0.65
	MEAN dbh	11.7	12.7	12.0	12.8
	s	0.70	0.69	1.5	0.71

$\underline{T}/A$ - Trees per acre
$\bar{x}$ dbh - Mean diameter breast height
s - Standard deviation (T/A)

Table A-2 Summary of Infested Trees in MPB Prevention Cut Unit, Casper Mountain, Wyo. 1987

PLOT		GREEN INFESTED (1987)	ONE-YR. INFESTED (1986)	TWO-YR. INFESTED (1985)	PITCH OUTS
1a	T/A	0.83	-	0.50	4.67
	x dbh	11.94	-	13.43	11.59
	s	4.20	-	2.03	1.75

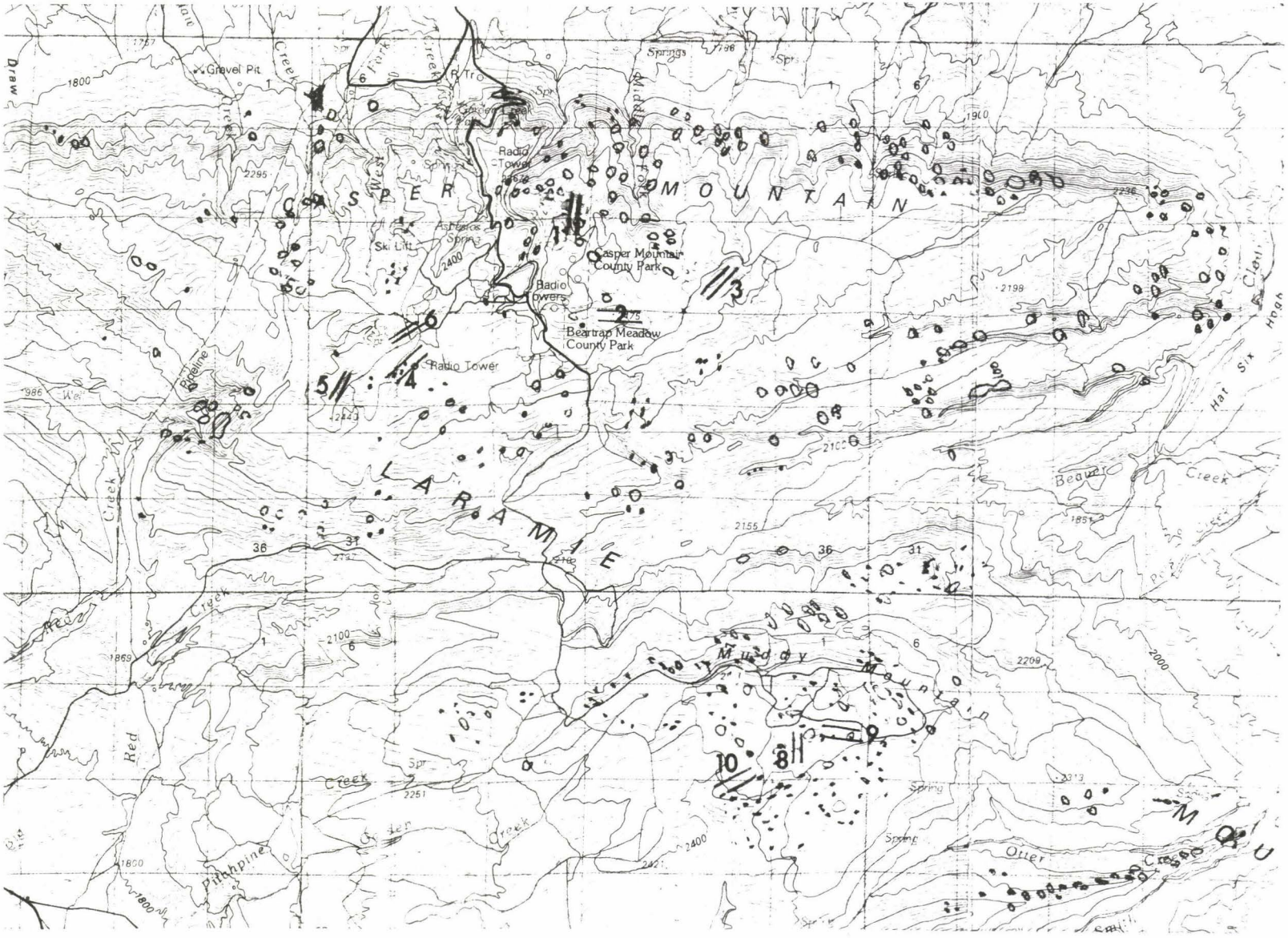
T/A - Trees per acre
$\bar{x}$ dbh - Mean diameter breast height
s - Standard deviation (T/A)

Table A-3 Plot Summary of MPB Infested Trees, Muddy Mountain, Wyo., 1987

PLOT		GREEN INFESTED (1987)	ONE-YR. INFESTED (1986)	TWO-YR. INFESTED (1985)	PITCH OUTS
8	T/A	3.88	8.75	8.38	6.88
	x dbh	10.57	10.75	11.66	10.51
	s	1.96	1.97	2.20	2.45
9	T/A	11.75	11.75	12.88	7.38
	x dbh	10.38	10.17	10.85	9.83
	s	1.93	2.57	2.12	1.87
10	T/A	6.63	6.50	9.63	7.63
	x dbh	9.53	9.41	10.60	9.15
	s	1.40	1.67	1.78	1.70
	$\bar{x}$ T/A	7.42	9.00	10.30	7.30
	x dbh	10.16	10.11	11.03	9.83
	s	3.99	2.63	2.32	0.38

T/A - Trees per acre
$\bar{x}$ dbh - Mean diameter breast height
s - Standard deviation (T/A)

Figure 1 - Casper and Muddy mountain vicinity map with 1987 survey plot locations and areas of recent mountain pine beetle faders from aerial observations.



LITERATURE CITED

Lessard, G. 1982. Biological Evaluation. Mountain Pine Beetle in State, County, and Private Lands, Casper Mountain, Wyoming. USDA For. Serv., Rocky Mountain Region, Timber, Forest Pest and Cooperative Forestry Management, Bio. Eval. R2-82-1. 11 pp.

O'Neil, C., and G. Lessard. 1985. Biological Evaluation. Mountain Pine Beetle, State, County, and Private Lands, Casper/Muddy Mountains, Wyoming. USDA For. Serv., Timber, Forest Pest and Cooperative Forestry Management, Bio. Eval. R2-85-9. 8 pp. and Appendix.